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METHOD FOR QUANTITATIVE CHEMICAL ANALYSIS OF BINARY MIXTURES OF JUTE AND ANIMAL FIBRES

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METHOD FOR QUANTITATIVE CHEMICAL ANALYSIS OF BINARY MIXTURES OF JUTE AND ANIMAL FIBRES

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Indian Standard

METHOD FOR QUANTITATIVE CHEMICAL ANALYSIS OF BINARY MIXTURES OF JUTE AND ANIMAL FIBRES

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 20 March 1972, after the draft finalized by the Chemical Methods of Test Sectional Committee had been approved by the Textile Division Council.

0.2 Two or more different types of fibres are mixed with one another for producing a variety of textiles. Such a mixture may be composed of different types of man-made fibres or different types of natural fibres or both. The composition of the mixture of textile fibres is governed by the ultimate use to which the textile materials are to be put.

0.2.1 Mixtures of textile fibres are being increasingly used for different purposes. The use of the different fibres in textile mixture has necessitated the formulation of standard methods for identification and quantitative estimation of fibres in mixtures. For the textile technologists as well as the traders and the consumers, the quantitative analysis of textile fibres in mixtures is of considerable importance.

0.3 This standard is mainly based on clause **14** of the ISO/R 1833-1971 'Textiles binary fibre mixtures quantitative chemical analysis', issued by International Organization for Standardization.

0.4 In reporting the result of a test or analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS : 2-1960*.

1. SCOPE

1.1 This standard prescribes a method for quantitative chemical analysis of binary mixtures of jute and animal fibres. The animal fibre component may consist solely of hair or wool or mixtures of the two. It is suitable for application to fibres in any textile form, such as fibre, yarn or fabric.

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*Rules for rounding off numerical values (*revised*).

NOTE — Before conducting an analysis according to this method, the fibres present in the mixture should be identified and sample to be analyzed should be freed from all non-fibrous matter. Dye in the dyed fibres is considered to be an integral part of the fibre and is not to be removed.

2. PRINCIPLE

2.1 A sample of mixture is dried and weighed. The nitrogen content of the mixture is determined and from this and the known or assumed nitrogen contents of the two components, the proportion of each component is calculated.

3. SAMPLING

3.1 Lot — The quantity of textile material of definite type and quality delivered to one buyer against one despatch-note shall constitute a lot.

3.1.1 If the textile material is fibre or yarn and the lot consists of more than 200 kg of fibre or yarn, it shall be divided into sub-lots, each weighing 200 kg or less.

3.1.2 Each sub-lot shall be tested separately.

3.2 Sampling for Fibre and Yarn — From a sub-lot 15 increments, each approximately weighing 10 g, shall be taken from different parts and mixed thoroughly. This shall constitute a test sample.

3.3 Sampling for Fabrics

3.3.1 The number of pieces to be selected shall be in accordance with Table 1. The pieces thus selected shall constitute a gross sample.

3.3.2 From each piece in the gross sample selected as in **3.3.1**, cut out small portions from at least two different parts weighing about 25 g. The parts selected shall well represent the gross sample as far as possible. In the case of fabrics with a definite repetition in weave pattern, the parts selected shall include all yarns in the complete repeat. Dissect the small portions of fabric thus collected into yarn and mix them thoroughly. This shall constitute a test sample.

TABLE 1 SAMPLE SIZES

(*Clause* 3.3.1)

LOT SIZE	SAMPLE SIZE
Up to 100	3
101 ,, 300	4
301 ,, 500	5
501 and above	7

4. APPARATUS

4.1 Sintered Glass Filter Crucibles — of appropriate capacity with a pore size of 90 to 150 microns (porosity 1) and fitted with ground-glass stopper. If stoppers are not available, the crucibles should be enclosed in weighing bottles for weighing.

4.2 Desiccator

4.3 Ventilated Oven — for drying samples at 105 ± 3°C.

4.4 Analytical Balance — capable of weighing to an accuracy of 0·000 2 g.

4.5 Soxhlet Apparatus

4.6 Kjeldahl Distillation Apparatus — The apparatus, as assembled, is shown in Fig. 1. It consists of a round bottom flask *A* of 1 000 ml capacity fitted with a rubber stopper through which passes one end of the connecting bulb tube *B*. The other end of the bulb tube *B* is connected to the condenser *C* by a rubber stopper and the lower end of the condenser *C* is attached by means of a rubber tubing to a dip tube *D* which dips into a beaker *E* of 250 ml capacity.

5. REAGENTS

5.0 Quality of Reagents — Unless specified otherwise, pure chemicals shall be employed in tests and distilled water (*see* IS : 1070-1960*) shall be used where the use of water as reagent is intended.

Note — 'Pure chemicals' shall mean chemicals that do not contain impurities which affect the results of the test.

5.1 Copper Sulphate Pentahydrate

5.2 Selenium Dioxide — nitrogen free.

5.3 Sulphuric Acid Concentrated — *see* IS : 266-1961†.

5.4 Standard Sulphuric Acid — 0·5 N.

5.5 Potassium Sulphate — nitrogen free.

5.6 Sodium Hydroxide Solution — approximately 40 percent (*w/v*).

5.7 Methyl Red Indicator — Dissolve one gram of methyl red in 200 ml of rectified spirit (*see* IS : 323-1959‡).

5.8 Standard Sodium Hydroxide Solution — 0·5 N.

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*Specification for water, distilled quality (*revised*).

†Specification for sulpluric acid (*revised*).

‡Specification for rectified spirit (*revised*).

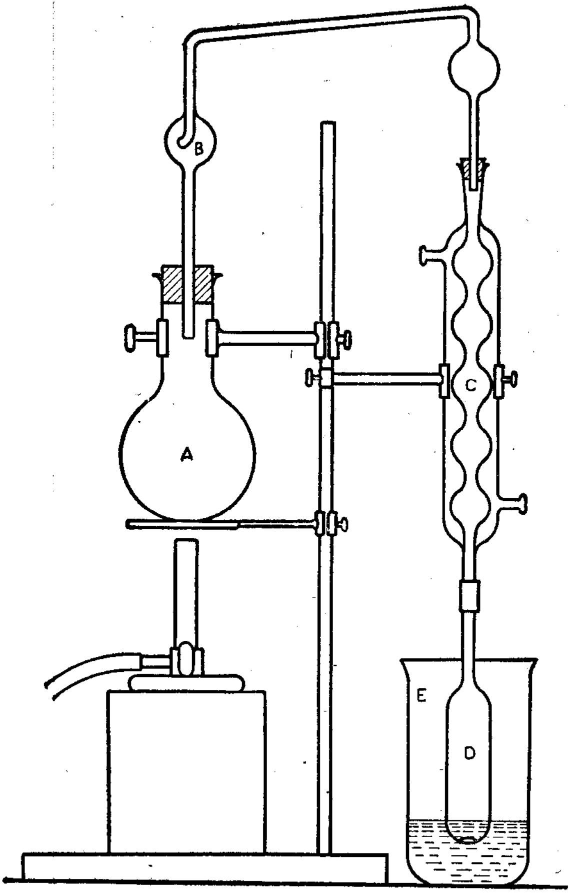

FIG. 1 ASSEMBLY OF APPARATUS

5.9 Carbon Tetrachloride

5.10 Ethyl Alcohol

5.11 Hydrochloric Acid — 0·1 N.

5.12 Enzyme

6. PRETREATMENT OF TEST SAMPLE

6.1 From the test samples, draw a representative sample weighing about 10 g and dry it at 105 ± 3°C for 3 hours. Treat the sample as given in **6.2**

to **6.6**. However, if the nature of the finish present in the sample is known one or more steps may be omitted.

6.2 Extract the sample in a Soxhlet apparatus with carbon tatrachloride for 2 hours at a minimum rate of 6 cycles per hour. This removes oils, fats, waxes, certain thermoplastic resins, etc.

6.3 Extract the sample with ethyl alcohol in a soxhlet apparatus for 2 hours at a minimum rate of 6 cycles per hour. This removes soaps, cationic finishes, etc.

6.4 Treat the sample with 200 ml of water at 50°C for 30 minutes stirring occasionally with glass rod or mechanically. Rinse thrice with fresh portion of warm water (50°C) and dry it. This removes water soluble materials.

6.5 Give an enzyme treatment to the sample under conditions depending upon the nature of enzyme used and rinse thoroughly. This removes starch, gelatine, etc.

6.6 Merge the sample in 200 ml of 0·1 N hydrochloric acid at 18°C for 25 minutes, stirring gently every 3 minutes. Rinse thoroughly with water at 80°C containing a few drops of amonium and then finally with plain water. This removes resins. Remove excess water from the sample by squeezing, suction or centrifuging and allow the sample to become air dry.

7. PROCEDURE

7.1 Take from the pretreated sample (*see* **6**) a test specimen weighing about 1 g. Cut yarn or dissected cloth into lengths of about 10 mm. Dry the specimen in a weighing bottle at 105 ± 3°C to constant weight and obtain the oven-dry weight of the specimen.

7.2 Transfer the specimen in the kjeldahl flask, add 10 ml of sulphuric acid, 2·5 g of potassium sulphate and 1 g of copper sulphate pentahydrate (a crystal of selenium dioxide may be added to facilitate the reaction). Heat the flask gently at first, until the whole of the fibre is destroyed and then heat it more vigorously until the solution becomes clear. Heat it for further 15 minutes. Allow the flask to cool, dilute the contents carefully with 10 to 20 ml of water, cool, transfer the contents quantitatively to a 200-ml graduate flask and make up to volume with water to form the digest solution.

7.3 Transfer exactly 10 ml of digest solution to distillation flask *A* and dilute to about 250 ml with water. Add about 5 ml (or more, if necessary, to make the solution alkaline) of sodium hydroxide solution carefully down the side of the flask so that it does not mix at once with the acid solution but forms a layer below it. Assemble the apparatus as shown in Fig. 1, with the tip of the condenser dipping in a known quantity of standard sulphuric acid in beaker *E* to which a few drops of methyl red indicator have been added. Mix the contents of the flask by shaking and distil until all ammonia has passed over. Detach flask A from the condenser and shut off the burner. Rinse the condenser thoroughly with water into the beaker E. Wash the dip tube D carefully so that all traces of the condensate are transferred to the beaker. When all the washings have drained into the beaker E, add two or three drops more of the indicator and titrate with standard sodium hydroxide solution.

7.4 Carry out a blank determination, using all reagents in the same quantities but without the material to be tested.

7.5 Repeat the procedure prescribed in **7.1** to **7.3** with the remaining specimen(s).

8. CALCULATION

8.1 Calculate the percentage nitrogen content in the dry specimen as follows:

$$X = \frac{28\ (V_1 - V_2)\ N}{m}$$

where

X = percentage nitrogen content in the clean dry specimen,

V_1 = volume in ml of standard soduim hydroxide solution used to neutralize the acid in blank determination (*see* **7.4**),

V_2 = volume in ml of standard sodium hydroxide solution used to neutralize the excess of acid in the test with the material (*see* **7.3**),

N = normality of standard sodium hydroxide solution, and

m = oven-dry mass in g of the specimen.

8.2 Using the values of 0·22 percent for the nitrogen content of jute and 16·2 percent for the nitrogen content of animal fibre, both values being expressed on the dry mass of the fibre, calculate the composition of the mixture as follows:

$$P_x = \frac{x - 0{\cdot}22}{16{\cdot}2 - 0{\cdot}22} \times 100$$

where

P_x = percentage animal fibre in the clean dry specimen.

9. REPORT

9.1 The report shall include the following information:

a) Type of material, and

b) Percentage of component fibres.